

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electrical motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with ~~the~~an operation state of the internal combustion engine, wherein:

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and

the motor control device sets a control amount of the electric motor while taking into account a variation of friction torque which acts on a rotation of the cam.

2-5. (Cancelled)

6. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electric motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein: ~~The valve-driving system according to claim 5, wherein~~

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and

the motor control device sets a control amount of the electric motor while taking into account a control state concerning intake or exhaust characteristics of the internal combustion engine and corrects the control amount of the motor such that an air fuel ratio is controlled to a predetermined target value while taking, into account, a control state concerning the air fuel ratio as a characteristic ~~the characteristics~~ of the internal combustion engine.

7. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electric motor as a driving source for generating rotation motion and a power transmission

mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein:

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and~~The valve-driving system according to claim 5,~~

the valve-driving system further comprising comprises an abnormality judging device which judges whether the valve-driving system is abnormal based on a correction amount with respect to the a control amount of the electric motor, the correction amount being provided by the a consideration of the a control state concerning intake or exhaust characteristics of the internal combustion engine.

8. (Currently Amended) The valve-driving system according to claim 31, wherein the motor control device estimates variation of the number of revolutions ~~revolution~~ of the internal combustion engine based on a variation in the operation state of the internal combustion engine, and sets a control amount of the electric motor while taking the result of the estimation into account.

9. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising

an electric motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

_____ a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein:

_____ the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and ~~The valve-driving system according to claim 3, wherein~~

_____ when a friction torque acting on ~~the~~ a rotation of the cam assumes a negative value, the electric motor is capable of being driven by a rotation motion of the cam to generate electricity.

10. (Currently Amended) The valve-driving system according to claim 13, wherein a motor rotation position detecting device, which detects a rotation position of the electric motor, is added to the electric motor, and the motor control device includes a cam position specifying device which specifies a rotation position of the cam based on the detection result of the rotation position of the electric motor.

11. (Original) The valve-driving system according to claim 10, wherein when a speed reducing ratio between the electric motor and the cam is defined as N:M (wherein, $N > M$, and N and M are integers having no common divisors except 1), N is set to 6 or lower.

12. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electric motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein:

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and ~~The valve-driving system according to claim 3, wherein~~

the motor control device includes an initializing device which makes the electric motor rotate in accordance with a predetermined condition when the internal combustion engine is in a predetermined state, and which grasps a rotation position of the cam based on a variation in a driving state of the electric motor which appears in connection with a variation in a friction torque of the cam while rotating.

13. (Original) The valve-driving system according to claim 12, wherein the initializing device rotates the electric motor when the internal combustion engine is stopped to grasp the rotation position of the cam, and makes a storing device, which can store information also during a stop time period of the internal combustion engine, store therein information indicative of the grasped rotation position of the cam, and the motor control device specifies the rotation position of the cam based on the information stored in the storing

device when the internal combustion engine is started next time, and starts controlling the electric motor.

14. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electric motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein:

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and ~~The valve-driving system according to claim 3, wherein~~

the motor control device includes a valve rotation executing device which drives the electric motor such that the valve rotates around an axial direction thereof in a predetermined time period during stoppage of the internal combustion engine.

15. (Cancelled)

16. (Currently Amended) A valve-driving system which is applied to an internal combustion engine having a plurality of cylinders for driving an intake or exhaust valve provided in each cylinder, comprising:

a plurality of valve-driving apparatuses, each of which is provided for at least each one of the intake valve and the exhaust valve, each valve-driving apparatus comprising an electric motor as a driving source for generating rotation motion and a power transmission mechanism provided with a transmitting section for transmitting the rotation motion generated by the electrical motor and a converting section for converting the rotation motion transmitted from the transmitting section into opening and closing motion of the valve to be driven; and

a motor control device which controls operations of electric motors of the respective valve-driving apparatuses in accordance with an operation state of the internal combustion engine, wherein:

the converting section of the power transmission mechanism converts the rotation motion generated by the electric motor into the opening and closing motion utilizing a cam, and ~~The valve-driving system according to claim 3, wherein~~

the motor control device includes a mode switching device which switches driving modes of the electric motor between a normal rotation mode in which the electric motor is driven only in the a normal direction to open and close the valve and a normal-reverse rotation mode in which the electric motor is normally or reversely rotated in accordance with the operation state of the internal combustion engine.

17. (Cancelled)

18. (New) The valve-driving system according to claim 1, wherein the motor control device determines parameters representing operation details of the valve to be driven in accordance with an operation state of the internal combustion engine, obtains estimated values of the friction torque based on the determined parameters, and sets a driving current of the electric motor in accordance with the estimated value of the friction torque.

19. (New) The valve-driving system according to claim 18, wherein the motor control device obtains the estimated value of the friction torque by summing up a base friction torque corresponding to basic rotation resistance which is applied to the electric motor when the cam is rotated and a variation component of the cam friction torque generated by a valve spring which urges the valve.

20. (New) The valve-driving system according to claim 18, further comprising an air fuel ratio sensor for measuring an air fuel ratio in the internal combustion engine, wherein the motor control device corrects at least one of the parameters based on a difference between an air fuel ratio measured by an air fuel ratio sensor and a target air fuel ratio which is set in accordance with the operation state of the internal combustion engine, and obtains the estimated value of the friction torque so as to reflect a correction of at least one of the parameters, thereby attempting to cancel a deviation between the measured air fuel ratio and the target air fuel ratio.

21. (New) The valve-driving system according to claim 20, wherein the motor control device determines whether or not the electric motor is abnormal based on a difference between a driving current obtained by reflecting the correction of at least one of the parameters and a standard driving current which can be obtained without taking the correction of at least one of the parameters into account.

22. (New) The valve-driving system according to claim 20, wherein the motor control device determines whether or not the valve driving apparatus is abnormal based on a fluctuation amount of the parameters.

23. (New) The valve-driving system according to claim 16, wherein the motor control device includes a lift amount control device which normally and reversely drives the electric motor in the normal-reverse rotation mode such that a lift amount of the valve is

limited to a predetermined value which is smaller than a maximum lift amount which can be obtained when the cam is rotated through one revolution in the normal rotation mode.